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THE IMPACT OF AUTOMATION ON SOCIETY

DOUGLAS Y. MUNNIKHUYSEN

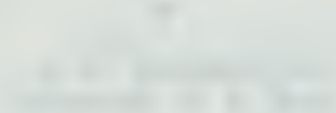
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THE IMPACT OF AUTOMATION ON SOCIETY

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A thesis submitted to the faculty of the School of Government, Business and International Affairs of the George Washington University in partial satisfaction of the requirements for the degree of Master of Business Administration.

June 6, 1962

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TABLE OF CONTENTS

	Page
INTRODUCTION.....	1
Chapter	
I. THE STATE OF THE ART.....	5
II. THE PRESENT IMPACT.....	16
Automation and the Labor Force	
Automation and Management	
Automation and Society	
Automation and National Defense	
Summary	
III. THE FUTURE.....	46
The Economic Future	
The Future Social Implications	
The Future Role of Government	
IV. PROBLEMS AND CONCLUSIONS.....	55
BIBLIOGRAPHY.....	59

INTRODUCTION

Down through the pages of recorded history man has gone through one major evolution after another distinguished by an economic revolution which bore the sobriquet of the outstanding characteristic of the era. However, one age, for some reason, failed to adopt its appropriate adjective and that, of course, was the Industrial Revolution which hailed the age of the machine. Today the world has entered into yet another and thus far unnamed age - "The Age of Automation."

This paper, perhaps, should be more correctly entitled, "The Impact of Technological Advances on Society," but because of the singular physical manifestation represented by automation as a characteristic of the age, this more descriptive title - "The Impact of Automation on Society" - has been chosen. Furthermore, since everyone seems to be concerned with computers and computer technology and its broader application in the form of automation, the term has become more meaningful to the average person. On the other hand, if a group of individuals were asked to define the term automation, it is certain that the answers would be different and would vary from the simple concept of mass production to the ultimate sophistication expressed in the concept of "computer control." Automation is difficult to define and knowledgeable men cannot agree among themselves as to its exact meaning because of the widely varying limits of its scope. For example, Edgar Weinberg says:

Automatic technology, automation, or automization are terms widely and interchangeable used to describe the most recent phase of American industrial development. They cover the increasing use, both in offices

and factories of various types of labor saving equipment having virtually continuous and, in some cases, self regulating operations.¹

Weinberg goes on to say that:

... automatic technology in industry may be grouped into four categories: (a) automatic machinery; (b) integrated materials handling and processing equipment; (c) automatic control systems; and (d) electronic computers and data processing machines.²

Others have sought to define the term in a more general way. For example, D. S. Harder, one of the originators of the term automation, calls it, "a philosophy of manufacturing." Also, it has been referred to as simply, "the Second Industrial Revolution." Peter Drucker goes to great lengths to state that the term should not be confused with "technocracy":

Above all, there can be little doubt that automation is not 'technocracy' under another name and that the 'push button factory' is not its symbol. Automation is not gadgeteering; it is not even engineering! It is a concept of the structure and order of economic life, the design of its basic patterns integrated into a harmonious, balanced, and organic whole.³

John Diebold, who helped popularize the term automation, considers the word in its present usage very hard to define and moreover there is a growing feeling that automation is difficult to define because it no longer merely represents the substitution of a mechanism for a human in some productive process regardless of whether it be manual or mental. Howard Boone Jacobsen and Joseph S. Roucek say: "Its [automation] meaning is nebulous; its use varies with the user."⁴

This writer agrees substantially with the latter authorities since it

¹Edgar Weinberg, "A Review of Automatic Technology," Department of Labor Bulletin No. 1287, June 1955. p. 3.

²Ibid.

³Peter Drucker, Harper's Magazine, April 1955, p. 47.

⁴Automation and Society, Edited by Howard Boone Jacobsen and Joseph S. Roucek, (The Philosophical Library, New York, 1959). p. 4.

appears more and more certain that automation represents not only a process but the results of the process. Furthermore, automation, viewed in almost any of its technical aspects is an involved, highly complex subject which does not lend itself easily to interpretation or understanding. Walter Buckingham in his outstanding book which treats the impact of automation on people, says:

... a really thorough understanding, even of the problems themselves [those arising from automation] would require going back to physics and electronics to comprehend the physical principles, to economics for developing the theoretical models, to the behavioral science for a proper concept of man, and to mathematical statistics for analytical techniques.⁵

It will suffice to say here that in a paper such as this it would be impossible to go into the specifics named by Buckingham and therefore it will be necessary for the reader to accept the term automation in its broadest sense. Using automation in this way gives it a close relationship to technology since one is a product of the other and progress in either is mutually interdependent. This relationship is much like the "Moebius Strip" which is so popular in science-fiction because it has no beginning or ending, nor is it possible to define either the inside or the outside. It is in this broad sense, that of automation as a social and economic force that the term is used in this paper.

The influence of this automated force on our society today and during the next twenty years has caught the interest and stimulated the imagination of this student and has been the motivating thought which has resulted in this paper. The problems currently facing our society become intriguing when one attempts to seek out their relationship to automation. This work does not pretend to find

⁵Walter Buckingham, Automation: Its Impact on Business and People, (Harper Bros., New York, 1961), Preface.

the solution to these problems since, as we shall discuss later, the problems themselves are largely undefinable.⁶ The writer's hope is that the casual reader will have his interest stimulated to such a degree that he will be aroused to question - where and how fast is our country and our society going? Even more important - what can and should an individual caught in this whirlpool try to do in order to control his direction?

In succeeding chapters, the art of automation in its more concrete form will be discussed, together with its limitations and its impact on today's state of affairs. For this purpose the topic has been quite arbitrarily divided up between labor, management and society as a whole. No discourse of this nature would be complete without some consideration of the impact of automation on the Armed Forces which reflect such a sizeable proportion of our gross national product and hence are an important influence on society itself. The role of the government, if not already predominate today, appears more than likely to be so in the future and will be duly discussed in that context. The final section will attempt to project the present into the future and to draw such conclusions that would seem to have some validity.

In the final analysis, we are concerned here with the relationship of man, labor, management and government to automation.

⁶Edith Harwith Goodman, "Effects of Computers on Personnel," Data Processing, (A Report on a Roundtable Discussion), Nov-Dec 1961, p. 9.

CHAPTER I

THE STATE OF THE ART

The precise extent of automation in its hard sense as a mechanized or electronic process is virtually impossible to measure other than in terms of the past and perhaps the future. In the area of computers and computer controlled processes, it is safe to say that twelve years ago was the "zero point." On the other hand, if we are to concern ourselves with mechanization, the past would certainly extend as far back as the "first" Industrial Revolution and possibly even farther. It is this writer's opinion that World War II ushered in the age of automation for it was during this period that the most remarkable breakthroughs in technology were achieved, the most predominant of which was in the field of electronics - the nub of modern control systems. It was the linking of mechanized processes with electronic control that brought the world automation in its fullest sense.

As late as 1955 there were only a handful of electronic computers in use and these were largely doing research work in laboratories. However, it was about this time that the first howls (if you eliminate the first Industrial Revolution) of pain were heard from labor regarding their fear of replacement by the machine. This was largely coincident with the movement of the computer into the office to assist in routine clerical functions. John Diebold, in testifying before the Senate-House Subcommittee on Automation and Energy Resources in 1960 stated that there were about 11,000 computers in use and about 4,500 more on order. Today

there are more than ten firms actively engaged in major programs producing computers or components integral to computer systems. The Michigan Economic Record reports in an article by Einar Hardin:

In July 1960 there were probably about 4,300 general purpose digital computer installations in American industry, of which 14% were large scale (costing more than \$1 million), 20% medium scale (priced between \$.5 and \$1 million), and 66% small scale but internally programmed computers. In addition, there were about 6,700 other digital computers including card programmed calculators.⁷

It is doubtful if there are any large businesses which are not using either their own computers or those shared from Computer Service Centers.

Present use of computer control systems is limited by the funds a company is willing to invest and, unfortunately, this is a large investment. In a Report published by Dun's Review and Modern Industry, it was stated that, "a company should not consider computer control unless it is willing to invest \$500,000 and wait three years for the pay-off."⁸ This is a rather severe limitation but with today's fierce industrial competition most companies have been willing to take the step.

To combat the high cost problem, many of the smaller companies have found ways to share computer systems, either through mutually operated data processing centers or through centers established on a business basis and whose time is for rent.⁹ It must be noted that the bulk of commercial application of computers

⁷Einar Hardin, "The Economic Impact of Office Automation," Michigan Economic Record, April 1961, p. 3.

⁸Dun's Review and Modern Industry, Special Report, March 1962, p. 47.

⁹Herbert E. Klein, "Computers for Everybody," Dun's Review and Modern Industry, Dec. 1961, p. 42.

today is still in the area of bookkeeping, record-keeping and business analysis. Computer control, or the automatic factory, is still the exception rather than the rule.

Mechanization as a product of technological knowhow has made tremendous strides. Secretary of Labor Goldberg has stated:

Since 1947, productivity has nearly tripled in the fibers industry; more than doubled in cigar manufacturing; about doubled in bituminous coal mining and agriculture; and increased by about two-thirds in such diverse industries as railroad transportation, canning processing and freezing, and cement manufacture...¹⁰

The chemical industry is a leader in the field of computer automation but organizations which deal in services, such as transportation, are rapidly converting to automation since "the machine" far outstrips man in the quick analysis of the many variables which affect their operational decisions. Administrative Government (as opposed to the Armed Services) is probably the single largest user of computers and is the leader in the technical knowhow of computer usage. At the same time, the Armed Services for some time have been making more and more use of computer technology in their logistic systems and in their operational techniques. Operational research, which had its beginnings in the study of military techniques, is particularly adapted to computer application but even further, the Navy for one is beginning to make use of computers in their operational decision making.

The Naval Tactical Data System has been developed based on the use of computers in collecting tactical data and rendering tactical decisions. This

¹⁰Statement of Arthur J. Goldberg, Secretary of Labor before the Subcommittee on Unemployment and the Impact of Automation of the Committee on Education and Labor, House of Representatives, April 25, 1961, p. 4.

system is currently undergoing tests and evaluation in actual operating installations in ships. Whereas business has used the digital computer, the Navy has long been a proponent of the Analog computer and is a leader in this field.

Probably one of the greatest innovations in the field of budget planning and execution has been the introduction of the "program package" and the selection of the "optimum" weapon package in terms of its cost, effectiveness and availability. These measures have been instituted in the Department of Defense under Secretary of Defense McNamara and his Assistant Secretary (Comptroller) Charles J. Hitch.¹¹ This program is designed to give a more nearly true picture of the actual cost of a weapons system, not only for the current budget period, but over the entire period of its effective life. Such an innovation could only be possible through the use of computer technology.

Little needs to be said about our MERCURY space program except that the fact that it is in being today would be virtually impossible without computers. This not only is true of the control of the orbits themselves, but in the design of the entire system which made the flights possible. Similarly, one of the most important deterrents against all-out war that the nation has today is the POLARIS missile and its carrying submarine - a program which came to fruition many months ahead of schedule largely because of a computer-based system which enabled the authorities in charge of developing the program to coordinate the entire effort to the smallest fraction of a degree and to know immediately when a trouble spot was developing.

¹¹Charles J. Hitch, The Economics of Defense in the Nuclear Age, (The Harvard University Press, 1960).

This has only been a light brush-over of the present use of automation - but what of its future growth?

A representative of the International Business Machine Corporation laughingly said recently that what the Armed Services wanted was, "a little black box, two feet on each side, weighing two pounds and costing two dollars." The fact is that the realization of these specifications might not be as remote as one would at first suspect. It was not too long ago that the public used to smile at the very idea of Dick Tracy's wrist radio, yet, just a few years later it has become a reality. Only five years ago we were promised that one day, through the replacement of vacuum tubes by a marvelous new development called, "a transistor," radios and television sets would be miniaturized to one quarter their then current size and the overall size of the set would be governed only by the size of the speakers and of the picture tube. Today, transistor radios are everywhere and TV sets only a few inches thick are readily available. There is promise of an even greater step forward in the field of Cryogenics. This new concept may make it feasible to have complete complicated electronic circuits printed in an area not over an inch square and having the thickness of a piece of photographic film. The advances have not only reduced size but have reduced cost and it is therefore entirely possible that such developments may one day in the not too distant future put computers within the reach of anyone who has the need for them.

Automation is a dynamic force since its roots are squarely those of technology. Since the latter depends to a great extent on the former, progress in this field is similar to two teams of horses attached to the same wagon pulling in the same direction, but with separate spans. The speed of the wagon will depend on the pull of both teams and at the same time the load of one pair depends on the load (or capacity) of the other.

Herbert Simon thinks that, "we can predict that within the very near future we shall have the technical capability of substituting machines for any and all human functions in organizations."¹² It is doubtful that one could find too many people who would support Simon in this extreme point-of-view, and perhaps it is well taken for Simon does go on to qualify his statement by saying that humans are likely to retain their comparative advantage over machines in activities that require sensory perception or manipulative and motor flexibility. In view of this, it would appear safe to conclude that the progress of automation is reasonably unlimited and what limits there are will be those imposed by economic necessity rather than those of technical knowhow. However, there are other limitations beyond those which restrict the application of automation today and very likely will continue to do so in the foreseeable future.

Automation suffers from some very severe and definite limitations. One of these is the relationship of automation to the human environment within which it must operate. One might draw a parallel with the law of physics which says that matter can neither be created nor destroyed. Similarly, nothing can be gotten out of an automated system that has not been put into it by the human beings which operate it. Human errors are reflected in the same magnitude with which they are put into the system. Likewise, a knowledge and understanding of the data inputs must be had before the output can be interpreted in a meaningful manner. Man is the master and not the slave of the system. However, it is not inconceivable that man could assume the unattractive role of slave if he did not understand the limitations of his system - that is, if he did not evaluate and

¹² Herbert A. Simon, "Management by Machines - How Much and How Soon?" The Management Review, Nov 1960, p. 12.

understand the product of his input.

Another situation which seems to be beyond the grasp of any foreseeable automated system is the environmental factor created by the human emotions. We all know that humans react emotionally not only in what they say but also in what they do. An automated system cannot interpret these gestures, intonations or unspoken words anymore than it can express doubt, uncertainty or optimism in its answers. Any system yet devised or dreamed of must react and work within finite bounds controlled by the operator.

Furthermore, as of the present time, the process of selecting the inputs is one thing, but instructing or programming the computer to handle an automated process is quite another. Although it is certain that this will not always be the problem that it is at present, for now, it is a process that represents considerable expense in time and technical skill which is a problem not usually associated with manually controlled processes. In addition, the capacity of data processing equipment is such that it can spew out information reports in a volume far beyond the capacity of man to utilize. Owen Smith in addressing the National Association of Accountants said, "We now have in electronic computers the literal ability not to swamp, but to bury a manager."¹³ A final limitation in this general area of output and input is that machines, regardless of whether they are producing goods, data or decisions, lack the creative imagination of the human being. They are manifestly unable to develop new ideas and are limited strictly to the ability to make decisions based on pre-set alternatives which are part of the program which governs their routine.

¹³Owen Smith, "Address to National Association of Accountants," Reprinted in The Comptroller, Oct. 1961, p. 486.

Since an automative process inherently is lacking in originality, it suffers from a corresponding limitation in its lack of flexibility. The system must be set to do a single repetitive task or series of tasks which combine to form the programmed process. If, for example, the products which are being produced require special individual specifications to meet the demands of particular customers, the use of an automated process is likely to be uneconomical. Walter Buckingham points out a case where it was cheaper to run an empty automated process around the clock than to shut down. Similarly, many automated processes are inflexible as to output as well as input. This is particularly true in some mixing processes which in most instances are more in the nature of an art than a science.

The requirement for finite data is of concern in that a computer is only capable of comparing quantities on a "black is black and white is white" basis. Hitch and McKean use the term - "incommensurables":

Incommensurables...are certain consequences of the alternatives compared - those consequences that cannot readily be translated into the common denominators that are being used. Thus, if gains are being measured in dollars (as they ordinarily are in a business problem), the effects that cannot be measured in money by any objective and generally acceptable method are incommensurables.¹⁴

A decision maker will take into account either consciously or subconsciously such qualitative factors as the personality of his opponent, education and/or the state of training of his employees. These are factors which do not lend themselves to the assignment of a numerical equivalent and would, therefore, be impossible to program into an automated routine or a computerized decision problem.

¹⁴ Charles J. Hitch and Roland N. McKean, The Economics of Defense in the Nuclear Age, (The Harvard University Press, 1960), p. 182.

Another good example can be illustrated in the business game technique such as proposed by Edward Bennion. Bennion proposes that a company's budget be set up and played against various economic conditions which might prevail during the budget year. The weakness lies in the theory that nature is not malevolent and therefore business is not malevolent. However, business is in fact malevolent and when using this technique there is no way to crank into the problem the consequences which may result from some action on the part of a malevolent business competitor. This is not to imply that this technique should not be applied or that it is not useful. The point is that there are important "incommensurables" in the problem which are beyond the capability of the computer to handle but which are at the same time vital to the decision process.¹⁵ However, it must be noted that some of this difficulty can be alleviated in a repetitive process by either trial and error or by empiric means.

There are other serious limitations which appear in an automated process but for our purposes it will suffice to mention just one more - the one which perhaps has the greatest philosophical import to the discussion at hand. An automated process is not only inflexible and limited in its output, but it is also a completely impersonal thing. As with the incommensurables, the human element is entirely removed from the process unless, of course, we consider the human factor in the selection of input and programming. However, this is not really the point. What is of real concern is the complete impersonal objectivity of the system, the process, or the concept; however one may desire to express the idea of the automated process. Our lives are more and more being spent in a world

¹⁵Edward G. Bennion, "Capital Audgeting and Game Theory," Harvard Business Review, Nov-Dec 1956, p. 115.

where as individuals we are becoming identified by a number rather than by name. Almost every adult now has a social security number; those in the Armed Services have their serial number; and even more recent - the bank will render the check casher a bill for an extra service charge if he fails to put his account number on the check. There is something personal about a name that cannot be replaced by a five digit number.

Even if a number appears to be impersonal, anyone who has filled out information on a card for use in a data processing system realizes what an even more impersonal thing this card can be. There was a recent report in the daily papers concerning how people who had committed all kinds of errors both accidental and contrived in reporting their income taxes had suddenly come forward quite voluntarily when they heard that the Internal Revenue Service was going to process income tax returns by machine. These people are not afraid of the tax men as individuals but they are afraid of the machine. In the eyes of the individual, the machine is an impersonal monster ruthlessly incapable of making any mistakes and devoid of sympathy and understanding. Similarly, an office which has been converted to automation is devoid of all those things that are associated with an office. In the place of the usual clatter of machines, the litter of paperwork, the cluttered desks and the steady hum of human activity, there is today a quiet room devoid of all the familiar sounds but filled instead with austere looking cabinets in whose presence the few persons in sight seem to be speaking in voices of hushed awe.

Enough of the physical manifestations of automation as they appear to today's observer who probably quite correctly views automation, despite the inconspicuous limitations which it possesses, with not only mystification but also

with a great deal of optimism. Mechanization, automation or the automated society, however one chooses to think of this modern-day phenomena is here and it is important that we learn just what affect it has on the world in which we live.

CHAPTER II

THE PRESENT IMPACT

It is very probable that the readers of this paper will have a difficult time recalling a single power woodworking tool possessed by their fathers. The odds are, that those who can, had either exceptionally hobby-minded parents or parents who possessed well above average wealth. Today things are radically different. This is the age of the "do-it-yourselfer" and except for those who are completely devoid of any interest or ability in the fields of mechanics or carpentry, there are not likely to be many among us categorized as heads of families, who do not own a power tool of some sort. A home workshop has today become almost commonplace and is evidenced primarily not for its mere existence but for the elaborateness of its appointments and equipment. This is a characteristic of life today which has come into prominence only since World War II.

The philosophy of the "do-it-yourselfer" has come about through the comparatively easy availability of the equipment needed to do home repairs and the present fad to pursue hobbies heretofore reserved for the craftsman. This availability has, in turn, been made possible to a great extent by the mechanized processes of the modern factory which has brought heretofore luxury items within the financial reach of the private individual. However, even more importantly, there has been a demand for the supplies and equipment required to do home jobs because of the ever increasing cost of repairs and alterations performed in the past by the plumber, carpenter, roofer, painter and casual handyman. The handyman of the past is today practically non-existent - he has been replaced

by the male head of the family. There are many other manifestations of the changing society in which we are living, but this expression, "do-it-yourselfer" has become so common to us (through advertisements if for no other reason) that it seems to best epitomize the change which has taken place over the last two decades. At the root of this change is the philosophy of automation in its broadest sense.

This has been the immediate effect of automation in the home but it is the purpose here to discuss this impact of automation as it is known today in terms of labor, management, government and the Armed Forces.

Automation and the Labor Force

Since it is quite obvious that the purchasing power of labor represents to a great degree the gross national product, it should be equally obvious that it is in the employment of the labor force that automation has its greatest demonstrable effect. For example, in the last ten years, production in the chemical and transportation equipment industries has gone up approximately 80% whereas the employment of workers in these industries has either remained constant or has actually decreased. During this same period, the chemical and transportation industries also became automated to a great degree and it is this shift in manufacturing technique that labor insists is the root of the unemployment problem. Furthermore, as a result of this increase in production, and the corresponding decrease in employment within a given plant that has given labor the basis for the principal against management. To be specific -- labor tells management that labor is suffering from the automatizing of the factory and therefore labor must have a shorter work week to guarantee more employment. Management tells labor

on the other hand, that because of the high wages demanded by them, it is necessary to automate in order to increase the productivity of the individual worker and to cut manufacturing costs. Both labor and management tell the federal government that it must step in and do something to regulate the other. Finally, the federal government tells both parties not to make wage demands or seek price increases because of the adverse effect it will have on the national economy. The end result is that no one is satisfied.

There is little doubt that in a given plant which has become automated or mechanized the end result is an overall loss of employment in terms of gross output. However, this seems to be counterbalanced, at least to some degree, by the increase in non-productive employees required by this increase in productivity. At the same time the loss of a direct labor requirement in a particular factory has been met by the growing population and the attendant increased demands for goods and services. The great question seems to be primarily - how long can this counterbalancing last?

There is one important facet of the employment picture that the overall labor statistics fail to bring out and that is the changes in skill requirements. As a single factor in the labor picture, the total impact on the employment figure is very difficult to even estimate because the productive employee is not laid off - he is simply retained in some other skill until for some reason he leaves of his own accord and then he is not replaced. It is perhaps significant to note that whereas the semi-skilled operators and unskilled laborers represent 45% of the very long-term unemployed, the professional workers make up less than 3% of the very long-term unemployed, although they represent 11% of the labor force. Employment in the steel industry has increased by some

38,000 people in the last fifteen years and this increase is composed entirely of professional, technical and white collar workers. Government estimates place the need for additional skilled workers at more than five million in the next ten years. This represents nearly one-half the increase of the entire labor force predicted for that time period. On the other hand, there seems to be a wide diversity of opinion on the actual relationship between the upgrading of employees which results from automation.

In a study conducted at the University of Michigan, it was found that in one plant that shifted to automation, affecting over 90% of the employees in the accounting department, there was no significant upgrading in the skills required. Other studies have come up with similar results. There does appear, however, to be an additional small input of skilled employees who may be associated directly with the programming and operating automated processes but these represent a negligible percentage of the labor force. The conclusion is that the increase in requirements for skilled workers stems primarily from the technological advances that have resulted from automation. It is a product of the times rather than the machine.

Automation has produced additional effects on the labor force in the form of another type of displacement problem. Increased productivity has enabled manufacturing plants to relocate in areas better suited to their raw material supply or their distribution systems since with the reduced labor demand, resulting from mechanization, it is feasible to pay fewer workers at a higher rate of pay. Similarly, increased productivity through automation has forced some firms to close their less profitable manufacturing plants and rely on the productivity of those more profitable. Although, concerted action has been taken by both

government and management to alleviate this problem, the worker, by his nature, has resisted a really successful solution. This has been the result of the worker's desire not to leave the community where he is living and where he has family ties and also by the unwillingness or inability of other workers to be successfully retrained in another productive skill. This has not always been the case, however, as has been demonstrated by several concerns. Inland Steel, Bell and Howell, Minnesota Mining and Manufacturing, International Harvester and Formfit Company have conducted successful employee retraining programs, have closed plants and relocated their employees or have found the employee satisfactory employment elsewhere.¹⁶

It should not be construed that automation is necessarily the cause of today's problem of unemployment. Automation in its modern technological sense has not been with us long enough to have a direct effect on the current situation since it involves only the manufacturing sector of the labor force - only about 25% of the labor force plus the clerical force which is another 15% of the work force. However, this 40% of the national work force is concentrated in a few major industrial organizations which could under adverse conditions have a telling effect on the national employment picture and hence the national economy.

The attempts of labor to offset the effects resulting from increased productivity by decreasing the work week have, in turn, been offset to a large extent by the worker himself. General Electric found, for example, that any re-

¹⁶

The Controller, March 1960, p. 124.

duction beyond a 36 hour work week resulted in employee resistance. Charles D. Stewart said in a paper presented in 1956:

At present, workers seem inclined generally to place a higher value on additional income than on more leisure, but this may not always be the case.¹⁷

There is no direct information available to indicate that there has been any change during the intervening six years. The Washington Post recently ran a series of articles on taxicab drivers in the Nation's Capital. The articles stressed the fact that a great proportion of the taxicab drivers in that city drove cabs in addition to their regular jobs. In addition to those who sacrifice leisure purely for more money there is also a segment of the labor force whose members because of their intelligence or special skills are in demand as part-time employees during their off time from regular employment. Although this latter group cannot be thought of as representing any major part of the modern labor force, it does portend something of a future condition which will be discussed in a later section.

Much is heard today of the current unemployment situation and much has been said in the foregoing paragraphs concerning automation but the relationship which exists between the two is a matter of controversy. It is quite true that automation has caused some unemployment of a temporary nature through the displacement of workers which has not been immediately counterbalanced by the creation of new jobs, but the economic conditions which have prevailed during the past two years can hardly be placed at the doorstep of technological progress as categorized by automation. However, there are still many factors which have contributed to the current employment situation and on which automation has certainly

¹⁷Charles D. Stewart, "Social Implications of Technological Progress," Excerpts from a paper presented before the 15th Annual Conference of the Canadian Ass'n of Administrators of Labor Legislation on Oct 3, 1956, Dept. of Labor Bulletin No. 1287, p. 11.

had some influence of considerable consequence. An example is the closing of marginal profit plants in favor of plants made more productive through modern automated processes. However, automation has not been the reason for the shut-down - it has made a shutdown feasible under conditions of the present so-called "profit squeeze." Similarly, automation has contributed in at least some degree to the controls which have made more feasible the mergers resulting from the present accent on diversification. William Karpinsky of the American Cyanamid Company recently wrote:

The shorter work-week controversy will continue to raise questions regarding the part automation has played in the over-all unemployment picture. There is evidence to suggest that automation has become a scapegoat for more prosaic economic happenings. Regardless of the causes, of course, unemployment is a serious problem to the individual and to the country; however, an overly simplified explanation of its causes hardly contributes to public understanding.¹⁸

On the other hand, the President's Advisory Committee on Labor Management Policy stated in their report dated January 11, 1962 that, "it is clear that unemployment has resulted from displacement due to automation and technological change.¹⁹ Yet the report goes on to say that the portion of unemployment directly attributable to automation cannot be isolated. At the same time the Committee stresses the point that automation and technological progress are vital to the future economic growth of the nation.

In the same report, Arthur F. Burns, President of the National Bureau of Economic Research, says in a dissenting opinion:

¹⁸William Karpinsky, "What's Ahead in Collective Bargaining?" American Cyanamid Co., Management Review, March 1962, p. 5.

¹⁹"Benefits and Problems Incident to Automation and Other Technological Advances," Report of the President's Advisory Committee on Labor Management Policy dated January 1, 1962.

...[the report] conveys the impression that technological advances are a major, if not the major, cause of recent unemployment. I know of no evidence to support this view, and I deplore anything that adds to the greatly ²⁰ exaggerated fears that many people have of what is loosely called automation.

Also, Henry Ford II in rendering an opinion on this report goes even further to say, in effect, that although automation may displace some individuals, in the long run, it results in increased income, expanded job opportunities and the workers who are displaced move rapidly to other jobs which ultimately become more remunerative.

This variance of opinion can be quoted almost endlessly but it seems rather apparent that there can be little argument that automation in the factory or the office will mean that in the long run, fewer people will accomplish the same job. The gray area lies between the point of original automated production and the point where it is necessary to hire additional hands to meet increased production. Labor officials are quoted as saying that only 390,000 production and maintenance workers are needed to produce the hundred million tons of steel formerly produced by 540,000 men ten years ago.²¹ Of course, management reports that the actual employment level is, in fact, increased due to the added requirements for engineers, research specialists and other up-graded skills. It is hard to dispute the figures cited by the Secretary of Labor in testimony before the House Committee on Education in which he stated that productivity in the soft coal industry has risen by 96% since World War II and yet employment in the industry has fallen by 262,700 during the same period. Similar figures are quoted for the

²⁰
Ibid.

²¹A. H. Haskin, "If We Had A 32-Hour Week, "Management Review, March 1962, p.38.

railroads where productivity rose by 65% as employment was falling by 540,000.

Thus, it seems quite irrefutable that, at least in given instances, automation or mechanization, as you will, has resulted in some reduction in employment. The question still to be answered is whether the additional productivity has been met by an increase in demand for labor in industries. This answer seems to be, at least in part, in the affirmative. However, one can scarcely find solace in this because the increased demand only partly compensates for those workers released by automation. In the final analysis one cannot avoid the inescapable fact that machines and automation are designed to replace the worker and it is only a question as to how fast automation will take over the worker's functions. As of today, the replacement has been on a comparatively minor basis when viewed in terms of the total productivity of the nation, but the rate of growth in the last decade has been astounding - the implications of this growth will be discussed at length in the final section of this paper. It will suffice here to conclude by quoting Edgar Weinberg who says:

So far as the immediate future is concerned, a brief review of some general factors accelerating and retarding the spread of technological improvement suggests the likelihood of a fairly steady growth but no economy-wide revolution.²²

Automation and Management

It has been at least intimated in some quarters that automation has resulted in a change in the composition of the working force and it is, therefore, quite natural to ask - has there been a corresponding change in management? Has automation resulted in the formulation of a new philosophy - if there is, indeed,

²²Edgar Weinberg, "A Review of Automatic Technology," Department of Labor Bulletin No. 1287, June 1955, p. 3.

a philosophy - which one can put his finger on and call it a "philosophy of management?" Has there been a change in the corporate organization structure which has resulted from the shift to ADP? Finally, if there has been the formation of a new management structure, is this change a result of the advantages accruing from the computer and the automated office or is it all purely and simply a natural product of the economics of the age in which we live? There are many more questions along this same vein which might be asked but for the purposes of this paper it will be reward in itself if a sensible discussion of just these questions can be evolved - whether there can be "yes" or "no" answers to these questions is open to considerable doubt.

Although office automation and management use of computers is growing by leaps and bounds, these technological achievements have neither been accepted widely enough nor have they been a part of our way of life long enough to pinpoint the answers to questions which may arise from their use. The true impact of the automated assistance to management has not as yet been recognized and as a result philosophies and structural changes which might be emerging are ill-defined and for the most part minor in nature. One writer has expressed this in terms of the white collar workers as follows:

Trying to define the impact of electronic data processing on the white collar office worker is like putting a finger on a globule of mercury. Result: many small elusive globules.²³

There is nothing to indicate that the composition of top management has thus far been affected by the shift to automation. However, there is every

²³ Profs. Mann and Williams U. of Michigan, "Organizational Impact of White Collar Automation," A paper presented to the Industrial Relations Research Association, Chicago, Dec. 28, 1958.

indication that there are coming into being many changes at each successively lower step on the management ladder. The most pronounced of these is in the area of computer management itself as compared with earlier office management. Whereas the clerical force has remained substantially constant in numerical strength, the technical managerial group has grown quite substantially. An examination of the organizational chart of most major industrial concerns that have shifted to computers will show a sizeable block devoted to computer operation and information control. This reflects a change in the management staff in that the people in this group are holding down jobs which for the most part did not exist ten years ago. Another major change has been the added stature now given to the executive with a financial background. The position of the Controller has undergone a rapid advancement up into the ranks of top management in recent years. Similarly, executives with financial rather than some other industrial experience are being appointed to the position of Chief Executive with increasing frequency.

The young college graduate with a degree in the sciences is being sought after but no more so than the man with the business major and a good reputation. Management is looking very hard for young people with the potential of entering business as the "young-executive." A great deal of money and effort are being expended by business to train the people they will need in added executive positions in the future. But if there has been little that can be pinned down concerning changes in the composition of top management, much can be said about the changes that automation is bringing about in the organizational structure of corporate management.

Perhaps one of the greatest single changes in managerial concepts that has occurred and flourished in the last twenty or thirty years has been embodied in

the idea of decentralization. This concept nurtures the philosophy that in an organization the decision-making responsibility should be assigned at the lowest possible level of management that has available to it the necessary skills and information. Thus the spirit of individual responsibility and initiative is permitted to develop and flourish to the ultimate betterment of the company and the immediate benefit of the individual. This is, of course, a far cry from the traditional concept of American business where, for most of its history, all the corporate power has rested entirely in the tightly clenched fist of the owner or later, the chief officer. However, as business has grown it has spread out geographically and has increased in complexity of organization to the extent which has made management by a single individual an impractical philosophy. To put it another way - the concept of decentralization has flourished because the limitations in communications have kept the traditional single manager from reaching out to the far reaches of growing industrial empires. Information technology has therefore had an unmistakable effect on industrial managerial organization!:

The science of management by information evaluation will be employed at higher and higher organization levels as the trend toward automation progresses.²⁴

The most obvious use for computerized systems in an office is quite naturally in the area of accounting. This phase of management is routine and highly standardized with few if any areas for real decision making based on any imponderables. By hand it is a slow cumbersome process with a requirement for a large number of personnel. In addition, modern business has found itself increasingly in the need for more timely information on its financial operations.

²⁴C. E. Knight and C. H. Fawcner of Monsanto Chemical Co., "Impact of Automation on Company Organization," The Factory of the Future, (American Management Assn., Inc., 1957), p. 191.

With the laborious manual techniques of the past, up-to-the-minute information on costs and other financial data has been for the most part unavailable. Commencing about ten years ago the great shift to machine accounting began and is today a common-place phase of major business systems. However, even as admirably suited as the computer might be to perform accounting functions, it has built into it a tremendous capacity for work. In most installations those accounting functions normally retained in the head office of a decentralized operation could not begin to utilize the capacity of a computer system to the extent required for either maximum economy or maximum return on the enormous sums required to install the equipment.

In view of the capacities inherent in the computer system and the ever increasing need for current information, more and more accounting functions have been removed from the level of the subordinate operating divisions and have been taken over by top management. Along with the return of accounting to the head office inevitably came the task of financial control. It is almost routine to find the ADF functions of large organizations today under the organizational management of the financial chief executive and in most cases directly under the Controller. These installations have caused management to cast a critical eye toward company organization in terms of its being a system for the flow of information. Shell Oil, Standard Oil of New Jersey and Texaco, to name a few organizations, have their controllers assigned at the level of the operating division under the direct control and supervision of the controller of the company. Similarly, some companies have assumed greater control of credit operations in the head office. The automobile industry, led by General Motors, has assumed an increasingly greater central office control over company operations.

The increased control at the level of top management, together with the availability of more timely information on company operations, has forced a greater realization of the mutual dependence which exists. One writer speaking of the return of credit control to the central office, says:

Management can expect fundamental organizational changes when EDP equipment is introduced into the credit department...there is an increased recognition of the interdependence among departments.²⁵

This is not only true of credit but is increasingly true in the relations which must exist between research and development and the marketing divisions. This relationship can best be maintained at the level of the top sector of the organization where the horizontal lines of communication are the shortest and the actual power of authoritative control is the greatest. Edward G. Koch stressed this when he wrote:

All these organizational realignments...have a common element: a marked tendency for strong central office control over marketing and product planning, analysis and strategy. This strict marketing direction from the top is akin to the rigid central-staff control found in the General Motors Corporation type of organization.²⁶

Koch goes on to say that this emphasis on central control of marketing activities may well, "portend a reversal of the trend to decentralization and in the future there will be a major re-grouping in the head office of the corporation of all the controls of major business functions."²⁷ The computer has played a major

²⁵Robert W. Johnson, "More Scope for Credit Managers," Harvard Business Review, Nov.-Dec. 1961, p. 109.

²⁶Edward G. Koch, "New Organization Patterns for Marketing," Management Review, February 1962, p.4.

²⁷Ibid.

part in this swing to "recentralization" because of the capability management now possesses to program all phases of operations into the system and observe the interaction which results.

Management's ability to now study the dynamics of business has given it a powerful new tool which even now is only beginning to come of age. If the function of management is to maximize profitable operations it must seek to, "interrelate the flow of information, materials, manpower and money."²⁸ The computer has made this possible. Heretofore, any study of company operations was historic or, at best, static in that situations could only be studied on the basis of information of conditions that existed at some given past moment in time. Today it is possible to put into the computer system all the variables of current and continuing operations and project the interaction which develops into a picture of conditions which are likely to obtain in the future. For example, the executive would like to know the net effect of a drop in sales in a particular geographic area on the finished goods inventory of next week in that area and what effect should this have on current production? On the basis of past performance and current data, trends can be identified which will be of terrific importance as considerations in business decision-making. The logical place to have this information and, indeed, the only logical place for the decisions to be made on this information is at the central office level which is the only place where the entire over-view of company operations can be maintained. The capacity of the computer system makes analysis such as this not possible but imperative.

²⁸Jay W. Forrester, "Industrial Dynamics, A Major Breakthrough for Decision Makers, " Harvard Business Review, July-August 1958, p. 28.

One final impact that the automated data system has had on management should also be discussed and that is the impact that technological advance has had on product development.

In addition to initiating a new age of technological advance, the post-war era has brought with it a new age of business competition for virtually every segment of commercial enterprise. Competition, together with declining profit margins, has made the search for a better product a matter of vital concern. In addition, technological science has brought with it a host of new products to the competitive market. One company estimated recently that over eight percent of its current revenue was coming from products that were still in the laboratory as recently as fifteen years ago. The scientific breakthroughs of the recent past have opened up huge new fields for possible product development and industry has been caught up in the rush to design and manufacture new and better products before they are squeezed out by a competitor. But despite the seemingly foreshortened time periods that modern development has engendered, because research and development is such a terrifically costly business, time has become of even greater significance. Private business is now firmly in the field of research and development and is devoting large percentages of its capital to this field. However, this raises a very serious problem for business--since they have little choice but to enter the field, but it is a field which has no profits, only high costs and a hope for profits in the future. As an example, the aircraft industry in 1961 devoted in excess of \$600 million of its own funds to research and development and this was in addition to the more than \$1.5 billion the industry received for the purpose from the federal government. All of this has meant that business has found itself faced with new problems of

not only managing another function but new and critical problems of control as well. The computer with the associated data systems has performed a vital task in reduction of development time but has also contributed additional problems in the control and administration of its use.

In summation of the subject of management reorganization resulting from automation, it can be generally summed up as a function of communication. What re-organization has taken place, has taken place as the result of the need for more and better communication, both across management and down through (or up) the levels of management control. Satisfactory communication systems for a large dispersed industrial concern are largely non-existent today although this is, to be sure, only a temporary situation. Nevertheless, the speed with which management must have information to act has placed added burdens on communication systems designed for a past era of business. The very weaknesses of available systems has acted to hinder automated progress:

At present, communication deficiencies at all levels appear to be the greatest deterrent to the efficient application of EDP systems.²⁹

So says Controller of the United Shoe Machinery Corporation, W. J. Horne. There are many thoughtful writers who believe that we will live to see more decentralization of management and not less. For the moment, it would seem that regardless of future communication improvements, the demand for dynamic decisions, based on the interrelation of all company operations, must be made at the fountainhead of information which for the foreseeable future will be the central office.

²⁹W. J. Horne, Ass't Controller, United Shoe Machinery Co., "Letters to the Editor," Harvard Business Review, Sept-Oct 1960, p. 16.

As a final segment of the discussion of management today and automation, it is important that we turn our attention to the question of management philosophy. The question immediately arises - is there in fact a management philosophy of any kind? In replying to this question, the Controller of a Southern industrial concern told this writer that in his opinion there was only one philosophy of management and that was to make a profit with a clear understanding that actions taken now may "come home to roost later." The inference would seem to be that in this case, at least, if there is a management philosophy outside that of making money, it must be a philosophy of managerial ethics. A further hint of this was the remark of another Controller from one of the major oil companies who said, "At ____, we don't evade taxes, we just try to avoid them". The result has been in the establishment of special divisions in management of many companies devoted exclusively to paying taxes, or "avoiding" them. Reason, however, would still lead us back to the basic motive of profit that must be the goal of any business which hopes to survive in a free enterprise system.

Another member of management told the writer that as long as he was hired to do a job for a company, he took it as his philosophy that making money for the company must be his credo within the limits of his own Christian moral code. If ethics are to be considered a part of the management philosophy, the recent price-fixing scandals speak poorly for management and its philosophy. Corporate philosophy necessarily has its roots in the age and economic conditions in which it exists.

One might go back to Scrooge of Dickens' "Christmas Carol" who can be considered as one extreme of "unenlightened" management philosophy. The plantation owners of our own early 18th Century South can also be considered as exemplifying

both extremes of a management philosophy - enlightened and unenlightened. In the slave owners and Scrooge, the elements of a managerial philosophy stem directly from the time and conditions existent in the era. Certainly, the "sweat-shop" associated with the turn of the century reflected a managerial philosophy which is repugnant to us today but one that was tolerated (or ignored) for a good many years - years in which some highly educated managements made very handsome profits. With the enormous power exerted today by government, labor and public opinion management must at least outwardly put on a show of having an "enlightened" philosophy.

Some authorities have sought to divide management philosophy into basic characteristics which describes the attitude of management with employees. The Vice President for Human Relations of the McCormick Tea Company says that there are two such philosophies - one being the cooperative attitude toward the employee and the other being the coercive attitude. Whether one chooses to take these as management philosophies or not is perhaps a rather moot point since for our purposes it will suffice if it is agreed that a management philosophy is a code of conduct as reflected in management actions. Any such philosophy must be in consonance with the managerial task of achieving a profit and hence be concerned with obtaining the maximum productivity from the employees with the maximum efficiency.

Has automation had any impact on a managerial philosophy? It is the thesis of this writer that automation as a machine has had no affect on industrial philosophy. On the other hand, as an integral part of our society and a phenomenon which has had, and will continue to have, far reaching effects on society as

of management policies in terms of not only profit but the long-run results of such policies on the relationships with government and labor. However, from a practicable standpoint, it must be argued that business has not much need for managerial philosophies since labor on one hand and government on the other will ultimately rule what they do.

Automation and Society

Automation has reduced working hours; it has given better working conditions to many people; and it has been an undeniable force for good in giving man a higher standard of living than has ever been known in history. It is not all good, however. Automation has in many cases resulted in increased monotony for the worker on the job; it has downgraded a great many skills; and has, to at least some extent, fostered a philosophy of "laziness" in many segments of our everyday life. In addition, there are those who condemn the entire concept in a vitriolic fashion as once otherwise thinking people were prone to condemn Watt's steam engine and those of the Industrial Revolution for its catyclismic impact on labor and the manufacturing process. Anything that is said about the ramifications involved in automation and their impact on life today must be considered transitory. We are not far enough down the road to know in reality what the true

meaning of automation is in terms of our current lives. However, it is important to realize that change is accepted in our society probably more willingly than in others because our society is founded on a vigorous and dynamic growth and in this lies strength. As new innovations come upon the scene, their good points are incorporated into society just as those strong points of the society itself are retained and bad ones eliminated. Our society can be adjusted to new conditions without being destroyed.

In any case, there can be no doubt of the truth of the words of Secretary Labor Goldberg when he says, "Automation has helped to make America the mighty industrial nation she is today."³⁰ One industry spokesman has backed up the cause of automation by saying:

To date the negative aspects of automation have been overstressed and U.S. Industries are anxious to eliminate these negative factors.³¹

Regardless of on what side of the fence a person might find his particular position there are few who can deny that the United States, as a nation, has been heading toward the ultimate realization of a "classless" society. The once haughty "400" of society are now a mere handful whose offsprings now provide the spicier ingredients of Cafe Society gossip. Their place has been taken by a new class of wealthy people whose backgrounds are as dis-similar as night and day. The once disdainful term "nouveau rich" has all but disappeared from the vocabulary of the "Westhampton Set" because they themselves can trace their money and prestige back only to a generation, if not (more than likely the case) to only

³⁰Arthur J. Goldberg, "Mechanization - A Problem for Management, Labor and Government," Mill and Factory, May 1961, p. 7.

³¹John I. Snyder, Jr., President of U.S. Industries, Quoted in the Wall Street Journal, 15 March 1962, p.3.

a few short months or years. Night clubs in New York, Las Vegas and Paris are filled with names unheard of before World War II. If you go down the wage scale to the man who works for an hourly payment, he is hardly classed today as the "laborer" he was once called. Today, the stonemason or the heavy equipment operator is earning pay at a rate which far outdistances a majority of the so-called white collar workers; money has been the great equalizer.

Another phenomenon particular to the age in which we live is the disparity between the working hours observed by labor and those of top management. Only recently an electrical workers union in New York City went on strike for a 24-hour work-week. They had to compromise on a 25-hour work-week. Contrast this with the corporation executive who is putting in a 10-hour day and carrying his work home with him at night. Medical statistics show that the overwhelming majority of heart attacks and ulcers are suffered by top management and not by those undergoing the rigors of physical labor for an hourly wage. These are the trends of our times and although they may be readily apparent to the thoughtful observer, it will be difficult for him to put his finger at a given point and say, "Automation did this!"

A person who has traveled in a foreign country cannot help but have been impressed with the apparent "backwardness" of even the most progressive nations. True, the use of home appliances is not an uncommon thing in foreign lands anymore, but these appliances are not found with anything that approaches the abundance with which they are found in this country. In this country they are common-place; abroad they are a luxury. This is just one indication of the advance that the American standard of living has made over those of other

countries and yet the United States, with a history that goes back a scant 200 years, is an infant in comparison. As a nation, we have become so imbued with making work easier that, although we have clearly outstripped all other nations in this respect, we have lost something in the process.

A traveler in Europe and the countries which border on the north coast of the Mediterranean will, in most cases, find a great deal of relaxing enjoyment, together with some amazement in that native institution known as "the sidewalk cafe." The American more often than not will find himself irritated at the casualness and lack of haste with which he is served. It is an absolute guarantee that he will become annoyed at the ritual half hour between the time he asks for his bill and the time he has it finally settled. In this country the only thing in any way similar is the now ritualistic ten minute coffee-break. Yet, the two do not compare. The coffee-break is a thing more or less begrudgingly granted by management mainly because the employee has at last garnered enough strength to demand it. A coffee-break is a brief break from office or production routines in which to hurriedly have refreshment. On the other hand, the sidewalk cafe is a place to take an unhurried and contemplative look at life and the world, and this is a fundamental difference between the Old World concept and that which is common to America today. The differences in outlook is nicely expressed by the retired Chairman of Inland Steel when recently he said:

Gone from our lives today are those periods of intellectual and spiritual pause for reflection which made our forebarers strong. Each day we are engulfed by the chaos and confusion which surround us. Sober thought before decision taking is difficult to achieve.³²

³²Clarence B. Randall, Retired Chairman of Inland Steel Company, Quoted in "Notable and Quotable," Wall Street Journal, March 6, 1962

Only the Japanese exceed Americans in their pell-mell rush and yet the Japanese have their ritual of peace and serenity in the home which is unlike anything seen in this country. Again, it is difficult to say in so many words that this difference in the American way of life is the direct result of automation. However, whether geometric proof can be achieved or not, it would appear that the American is either rushing to keep up with the machine he has helped to create so that he cannot be outdone, or else he is hiding his deep sense of frustration by trying to outrun the machine.

It is this rushing which sets the American tourist apart from other travelers in a foreign land. However, contrast this to our earlier statement which implied that American society has adopted a philosophy of laziness. It is this student's contention that as a direct result of automation, the American has gotten lazy in both habits and in mental outlook. In the United States today, everyone rides. This is not to say that riding is bad per se, but it is to say that it is bad when riding becomes such a habit that people will go without something they want rather than exert the physical effort in walking to get it. We are a nation literally on wheels. Once the politicians talked about, "a car in every garage;" now we have gotten to the point where a two-car family is no longer the sign of a well-to-do family - it is the ordinary. The nation is so irresponsibly geared to the wheel that the population is out on the highways killing each other off at a rate not even experienced on the battle fields of a major conflict.

Technological advances in science and particularly medicine have given rise to problems of their own. Today we do such an excellent job of increasing the average life expectancy that we now have the problem of the "aged." The Bureau of Labor, for example, has published statistics which show that over

one-third of the employed are aged 45 or over. A man of sixty is no longer unemployable as he once might have been, but he has to be moved out of the labor force to make room for the young men who must start making a living. The result has been, of course, the emphasis on old age benefit plans, retirement plans and other group plans which are intended to encourage the older citizens to retire from the work force. There have been other phenomena associated with the growth in the population of the "senior" citizen - the sudden growth of whole communities in warm areas like Southern California and parts of Florida populated largely by retired people.

Finally, the modern age has been marked by a growing dependence on government to satisfy all manner of personal needs. Ever since the depression of the thirties the public has manifested by their votes their desire for an expansion in the federal government. This increased activity on the part of government has resulted in tremendous financial programs which ultimately pour many millions of dollars back into the economy. Examples are such things as the trust funds set up to run various Veteran Programs and Social Security benefits. In addition, there are grant loans which are passed out to schools and other public institutions. Another huge item of federal expenditure has been in the program of subsidies which are granted for price supports, to assist transportation systems and to foster new industries. At the local level it is virtually accepted that the first course of action in any problem concerning financial support is to first try to get the money needed from the federal government. These expenditures, combined with those made in behalf of national security, have put government in the position of wielding a very "big stick" in influencing the national economy.

The increased dependence on "Big" government by the mass of people has led to the government growing by leaps and bounds in not only size but in the power with which it influences our daily lives. The very proportion of the gross national product which is the result of government spending can literally make or break the national economy. On other fronts, the federal power is being felt more and more. Congress with its power to investigate has learned to use the "investigating" sub-committee not only as a powerful political weapon but as a means of control over industrial and non-government operations. The recent attempt of the United States Steel Company to raise prices resulted in the very vivid public display of the government's power of coercion. If the company did not go along with the economic policy as announced by the Administration, they would soon find that all the power of the Attorney General's Office, the SEC, the Treasury, the Congressional Committees and the threat that government would not buy their steel, would be used against them. Even with the support of the rest of the steel industry, it is doubtful that the company could withstand pressures such as these.

In summary of the impact of automation on our present society, one is forced to deal with the many imponderables which typify our age. The fact that there has been an increase in leisure time and a gradual re-shuffling of the class structure is fairly evident; that labor is influencing life to an extent previously unheard of is also true and is pretty much a direct result of labor's reaction to the real or fancied "hurts" they have suffered as a result of automation. However, whether one can say that "Big Government" and our modern lacadaisical philosophy as citizens are a result of automation is another matter. There is no doubt that automation has made so many things both easy and available that it is one of the dominant influences of modern society.

Automation and National Defense

No discussion of automation or technological progress could begin to be complete without a discussion of its impact on the national defense posture of the country for it is here that technological advances have had the greatest influence. The cost of national security has now risen to the point where it is not only a major factor in the national economy but is a drain on our national resources as well. Defense money comprises over half of our national budget. The Congress has authorized expenditures in excess of \$47.8 billion for the Fiscal Year 1963 for defense out of a total Federal Budget amounting to about \$90 billion. It is important to realize that we are speaking in terms of a minimum acceptable defense program and not that program which would be desirable if unlimited funds and resources were available. From the point of these costs alone we have a very serious national problem and particularly so when it is considered that future expenditures will almost certainly go up, not down.

The cost of the individual weapon has increased by a factor of ten. A pre-WW II submarine cost about \$7 million. A nuclear powered submarine costs today probably in excess of \$60 million. An aircraft carrier, conventionally powered, costs more than \$300 million. A bomber today costs as much as a squadron of bombers did twenty years ago. So much for costs - what are we getting for this tremendous increase in price of weapons? A weapon of the modern age is a complex package of intricate machinery and electronics that stupifies the imagination. The complexities of current weapons are such that a single POLARIS equipped submarine can deliver more tons of explosives on target than all the bombs that were dropped in WW II.

What about this enormous expenditure? How does it affect our national well-being and what has this to do with automation? With an annual expenditure of public funds for defense which is approximating 10% of the GNP, there is a real problem of limiting these expenditures in terms of what is best for the national economy. Some authorities suggest that it is feasible to commit as much as 16% of the growing GNP to defense. However, in a day when it is a national objective to increase the growth rate of the GNP, can this rate of expenditure be tolerated when something over half of it is non-productive and adds nothing at all to the nation's economic progress? Similarly, with the costs of an individual weapon in mind, how can we be sure that a given weapon is the one that will give the greatest effectiveness for the dollars spent? One safeguard is that proposed by Hitch and McKean and is the one currently being used.³³ The system is based on computer analysis of all the variables in a weapons system, including procurement cost, availability and effectiveness in comparison with other alternative weapons. Although the system is at present imperfect, it is receiving the full time and attention of the Department of Defense and gives promise of being an invaluable aid in making the major decisions on defense systems in the future. The important thing to note is that we now have a defense problem in terms of costs to our national well-being that is so tremendous in proportions and so complex in its ramifications that only an automated decision-making process is capable of considering the variables involved and properly determining their inter-relationship and relative effectiveness.

³³Charles J. Hitch and Roland N. McKean, The Economics of Defense in the Nuclear Age, (Harvard University Press, 1960)

Summary

That there have been changes in our economic society largely due to technological progress since World War II, there can be little doubt. However, to determine how much of this can be traced directly to the door of automation is a matter of some conjecture. Most certainly labor, which has seemingly received the brunt of the impact, is highly vocal on the subject and equally loud in their proclamations of management responsibility to make up the difference in employment opportunities through shorter hours and higher pay. Nevertheless, labor has not condemned automation but has praised it at every turn as being the great promise for the future. In fact, labor, government and management agree that automation and technological progress are essential to the general, the economic strength and defense of the nation.

Management has undergone some reorganization and a change in composition insofar as that direction is required for the large increase in technical and scientific personnel now employed. Whether a new and actual management philosophy exists remains a question, the answer to which will depend on the individual and the organization. In any case, it would still appear that management has not become philanthropic in motivation and is still oriented toward making a profit within the legal and social boundaries in which it must operate.

Society as a whole has chiefly reaped the benefits of technological progress in terms of an increased standard of living at a level unsurpassed in history. There is a strong possibility, however, that society may have lost some spiritual values along the way. There has been the birth of a new, or at least

a reinforced class of society, based on wealth and the size of the traditional middle class has increased. This is manifested in the seemingly strong desire on the part of most for a "middle of the road" political philosophy and the turn to a bigger and better welfare form of government.

Government, following the lead of the voter, has become the biggest employer and the biggest spender of money on earth. Along with added emphasis on group benefits has grown a philosophy of government which now touches virtually every phase of our lives. However, perhaps most important of all, the government control of fiscal policy has grown to the point that although the business cycle may not be deliberately controlled, it can, at least, be strongly influenced.

Finally, the age of automation has brought with it new problems in the technology of national security, the cost of which and its vital necessity, have forced the development of new concepts of critical appraisal. Never before has the country been faced with a condition in which the decision to go for one weapons system in lieu of another may well spell doom for the future.

Thus, the American citizen is living in a world which is more luxurious than anything dreamed of by his forebearers but the citizen has not reached this happy state without developing problems of such magnitude that one is inclined to ask, "Is it all worth it?"

CHAPTER III

THE FUTURE

In the preceding sections the present state of the art of automation has been discussed, together with an examination of the impact of automation in our national life as we know it today. A conscious effort has been made not to project these more or less factual discussions since any such projections are necessarily based not so much on what we know today, but on pure conjecture. There are many so-called authorities who profess to be knowledgeable on the subject although there is ~~only~~ anything but general agreement among them. But the future of automation is pretty generally agreed to hold great things in store and is controversial only in the extent that the efforts of government, business and management must be controlled in the application of automation.

In the following sections the future implications of automation will be examined first, as they portend to the economic life of the nation; second, the social implications; and, finally, the effect that automation will have on the future role of government. Such conclusions as can be evolved will be reserved for the concluding section of the paper.

The Economic Future

In the years which are ahead, the labor force will grow at an ever increasing rate. The U.S. Department of Labor estimates that in the 1960's the labor force will grow at a rate 20% faster than in the preceding ten years.

Along with the large increase in the total number of workers, major changes will take place in the composition of the labor force as well as in the kind of jobs that the economy will demand. These same estimates place the growth of employment at about the same growth as that experienced by labor. However, this growth will be unbalanced between industries as for example, it is already apparent that people are spending more and more on services which would indicate that such industries as construction, finance, insurance and real estate will be increasing rapidly while the traditional leaders such as manufacturing and raw material supply will only increase moderately. Agriculture will actually face a decline.

During the decade of the sixties, the fastest growth in the labor force occurred among the professional and technical occupations, especially engineers, scientists and technicians. It is notable that during the past ten years these same groups exceeded in number for the first time in our history the number of persons employed in manual occupations. Thus, it is apparent that the biggest growth will be in the segment of the working population which will require the most education and training. This change in composition is the result of several major shifts in our economic enterprise. Chief among these are the continuing shift from an agricultural economy to an industrial economy, the rapid application of technological improvements resulting from the heavy expansion of research and development activities, and the increasing size and complexities of modern business organizations and the attendant complexity of record-keeping now associated with businesses of all types.³⁴

³⁴Hammer, Challenge of the Sixties (Statistical Approach)(Department of Labor, 1960)

Balanced against this change and growth is the situation faced by business in general but principally by industry. Responsible economists have estimated that more than \$75 billion of our \$300 billion worth of plants and equipment is obsolete or rapidly becoming so.³⁵ There are other more pessimistic figures available which estimate this obsolescence as high as 80% of the total value. However, as cited earlier, business is operating in an environment of declining profit margins which tend to make plant modernization impracticable. If, on the other hand, business does find the funds to modernize, which it must do to stay competitive, such modernization will result in further application of automation. Automation will work to increase productivity at the expense of either the same work force or an actual reduction in the number of workers per unit produced. Herbert Simon says that this is not necessarily true.³⁶ The overall employment picture must be in terms of the increased production required to give employment to 1.8 million people affected by these changes in productivity. This is not too great a problem as is brought out by the population increase which is expected to gain some 50 million in the next 15 years. The problem then seems to be whether or not the huge population increase will result in a sufficient additional demand for goods and services in order to offset the growth of the labor force. The consensus of opinion among most authorities is that there should be no particular concern for the future in this regard if sufficient planning and cooperation exists between management, labor and government.

One spokesman says that although there may be short-run disparities

Ibid.

³⁵ Herbert A. Simon, "Management by Machines - How Much and How Soon?", The Management Review, Nov 1960, p. 16.

between the supply and demand for labor, our modern capacity to affect a significant force on economy will serve to keep the problem under control:

There is no reason to think, so far as general economic stability and the business cycle are concerned, that our capacities to stabilize the economy through monetary, fiscal, and other policies will not increase more rapidly than the problem we face arising out of increasingly rapid technological progress.³⁷

John Diebold in his book, The Challenge of Automation, avers that automation is a challenge rather than a threat to the economy. Automation, he says:

promises to invigorate the economy and offers the opportunity for as great a reward as any force our economy has ever faced.³⁸

The "Report to the American Management Association" encapsulated these trends which will shape the business future:

(1) The growing capacity of the economy to increase production and to make technological change; (2) the growing capacity of the economy to increase the demand for goods (higher pay, greater GNP); (3) the tendency of the economy to outgrow the business cycle; (4) the growth of institutions that tend to produce a slowly rising price level; and (5) the increasing intensity of competition.³⁹

Under Secretary of Labor Wertz summed up the future economic picture best when he said recently:

Perhaps no other economic issue so puts democracy to the test today as this question of whether we will use automation as a device with

³⁷Charles D. Steward, "Social Implications of Technological Progress," Excerpts from a paper presented before the 15th Annual Conference of the Canadian Association of Administrators of Labor Legislation on Oct 3, 1956, Dept. of Labor Bulletin No. 1287, p. 11.

³⁸John Diebold, "Application and Uses," The Challenge of Automation. (Public Affairs Press) 1955, p. 12.

³⁹Sumner H. Slichter, Factory of the Future, (Report of the American Management Association, 1957), p. 23.

which to displace and dispense with man, or as a means to increase his stature.⁴⁰

The Future Social Implications

The greatest social implication of automation for the future is in the utilization of the leisure which automation appears to promise in abundance. Recently an electrical workers' union in New York City won a contract for a 25-hour week for its members. The standard cry of union officials is for a shorter work week in order to thus create more jobs. The five-day work week is a product of the recent past and within the memory of most readers. The entire trend of labor is toward a shorter work period and, therefore, toward more leisure. What are the implications of this leisure? Is more leisure for the good or bad of society?

This truth seems to lie in the direction that leisure is good only if it is creative leisure. There is an old childhood saying that, "idle hands make for mischief" and this is particularly appropriate if a large proportion of the American public suddenly find themselves with an abundance of leisure time on their hands. If people are to be idle they must have something to do or they will become restless and irresponsible to the mores of our society. Street gangs have their roots in idleness which is not being put to constructive use. On the other hand, can creative leisure be enjoyed without added income to support it? Probably not, for it seems evident that the more idle time one has on his hands the more money he will spend on entertainment for himself whether it be in the

⁴⁰Address by Under Secretary of Labor W. Willard Wertz at the Governors' Conference on Automation, Los Angeles, California, Nov. 27, 1961

nature of home improvement, hobbies or theatrical entertainment. Secretary of the Interior Udall has given a governmental awareness of this problem in his search for new recreational areas for a leisure-time public to use. It is certain that on a national basis we will have to come to grips with the problem of leisure, and also with the spiritual and cultural problems which are closely associated with leisure. Senator O'Mahoney quotes Adolfe Berle as saying:

For the first time in recorded history a huge population is concerned with the problem, not merely of living, but what kind of life they want to live. The 'good life' of the Greek idealists will be within reach if we know what to choose.⁴¹

It is not beyond the bounds of reason that leisure might become a major goal of society. To quote a popular comic, "Man cannot live by bread alone; he must have peanut butter." As silly as this may sound, it points to the truth that we must have satisfaction in our living which cannot be derived from an environment barren of cultural values. Maslow demonstrated this effectively in his pyramid representing the "hierararchy of needs." Senator J. O'Mahoney faced this problem over five years ago when he said:

But it certainly is an important matter for public policy to see what levels of education, understanding, and appreciation are raised so that the new materialistic processes shall not crush our basic moral forces but, rather, under spiritual concepts which guided the founders of our Government, make for a better world as well as a richer and easier one.⁴²

What of these moral values? The recent flash of price-fixing scandals would appear to indicate at least some laxity in business ethics which by and large only exist in a society which condones such tactics. The general moral

⁴¹Senator Joseph C. O'Mahoney, "Public Policy Implications," The Challenge of Automation, Collection of papers delivered at the National Conference on Automation, (Public Affairs Press, Wash., D. C., 1955), p. 1.

⁴²Ibid.

value of society, as it exists today, is open to considerable question as to the qualities of the ethical values which it supports. Dun's Review and Modern Industry quotes one labor arbitrator as saying:

Ten years ago the cases of industrial theft I was called in to judge could be counted on one hand. Yet today, I could almost build a practice on employee dishonesty.⁴³

Hotelman Conrad Hilton supports the case for society's own foundation as the basis for corporate morals and says that, "the question of ethics is applicable not only to the business community but also to our entire society."⁴⁴

However, as the most influential citizens of our times, business leaders must accept the responsibility in at least some measure for the integrity and ethical values of the general public.

The United States represents something brand-new in civilizations for it is a business culture and a business civilization. The two primary forces in American life today are business and government and it is through these sources that an ethical environment must be established if the nation is to continue and flourish and not take the down-road as patterned by ancient Rome.

A final consideration must be given to the future impact on our society which will obtain if the artisan disappears from the American scene. The factory worker who spends his day doing some automated and meaningless task derives no satisfaction from his work. Maslow and many others have repeatedly demonstrated that satisfaction is a basic need. If job satisfaction is removed, however,

⁴³Dun's Review and Modern Industry, Special Report, March 1962, p. 47.

⁴⁴Conrad Hilton, "Business Ethics," (Letters to the Editor), Harvard Business Review, Nov.-Dec. 1961, p. 16.

will not also creativity and imagination be removed? The answer most certainly has to be in the affirmative. A future problem which must be faced by all of society is an attempt to establish a working and living environment which will stimulate imagination, creativeness and promote living enjoyment.

The Future Role of Government

World War I forced on this country a pattern of assumption of power and control by the federal government which has not been lessened by another greater war and a near catastrophic depression. People now expect government control and assistance as a matter of every day life. There is nothing to indicate that the influence of "Big Government" will do anything in the future but get bigger. It must be accepted as a virtual fact that the "welfare" state is here and here to stay and flourish.

Automation and the attendant conflict between labor and management have given government an even bigger role in industry than might ordinarily been the case. With this role comes the added responsibility of exerting a wholesome influence in this protracted dispute between two powerful social elements. Secretary of Labor Goldberg has gone on record as saying, "A major goal of government should be to encourage management and labor to assume this responsibility for retraining."

There can be little question that government of the future must take an active role in effectively influencing those forces which are arriving on the scene literally every day as a result of one technological breakthrough after another. The achievement of the ultimate goals of our social system must be stated by government and their accomplishment through technological progress must be accomplished without the sacrifice of human values. This can only be

done by a combination of private and governmental action, acting jointly and within the principles of a free society.⁴⁵ The immensity of the problems arising from automation (though undefined) are such that Senator O'Mahoney goes on record as follows:

...automation is a development which, unless it is properly regulated under existing Constitutional authority, could easily become stronger than government itself.⁴⁶

It is important to note that government's obligations will not stop at purely regularitory measures. As previously pointed out in the discussion of leisure, the future appears to be the strong responsibility of government:

One of the heaviest responsibilities of those who govern us will be to try and exert a wholesome influence on leisure-time activities with a view to broadening public culture, preferably on humanistic lines, so as to counteract the materialistic mentality which could arise in a world dominated by automation.⁴⁷

In the future, government has an increasingly important role to play in the furtherance of the opportunities which have to be accomplished in the field of education, but most important of all, the government must work to maintain an economic stability if the nation is to grow and flourish in an automated society.

The ultimate problem which will have to be solved is that of the cooperation which must exist between the various forces at work in our environment. The recent conflict of interests between "Big Steel" and "Big Government" was a

⁴⁵"Benefits and Problems Incident to Automation and Other Technological Advances," Report of the President's Advisory Committee on Labor-Management Policy, dated January 1, 1962.

⁴⁶Senator Joseph C. O'Mahoney, "Public Policy Implications," The Challenge of Automation, (Public Affairs Press, Wash., D. C., 1955), p. 1.

⁴⁷J. Garcia Santesmaes, "A Few Aspects of the Impact of Automation on Society," Volume XI (1961), No. 2, p. 107.

clear demonstration of how two major forces in the economy should not behave. The Chairman of the Board of Studebaker-Packard summed up this need for considered cooperation only recently in an address before the National Industrial Conference Board:

Must business and government grapple for the upper hand until one or the other prevails? Or can't business, government - and, for that matter, labor - come together in a sincere and lasting fusion of purpose and action?⁴⁸

⁴⁸Clarence Francis, Chairman of the Board, Studebaker-Packard Corp. at 419th Meeting of the National Industrial Conference Board, Dun's Review and Modern Industry, March 1962, p. 26.

CHAPTER IV

THE PROBLEMS AND CONCLUSIONS

The primary problem outside pure economics, which automation seems to bring about, is the relationship between man and his machine. There is actual fear expressed in some quarters that the computer will become so powerful that it will one day become the master rather than the slave. This would appear to be a little severe for as one writer puts it, "You can always reach down and pull out the plug!" It is rather difficult to imagine that man can create something which can be creatively more powerful than himself. A greater fear should exist in those areas already mentioned - in the loss of job satisfaction and in the problems of leisure which will be created.

Herbert Simon believes that the problems of the automated world will be three in number, namely:

- (1) developing a science of man; (2) finding alternatives for work production as basic goals for society; and (3) formulating man's view of his place in the universe.⁴⁹

Walter Reuther, in voicing Labor's view, reiterated Simon's point:

Our great dilemma in America is the fact that there is a gigantic gap between the tremendous progress we have made in the physical sciences, and our lack of ability to make comparable progress in human social sciences.⁵⁰

⁴⁹Herbert A. Simon, "Management by Machine - How Much and How Soon?", The Management Review, Nov 1960, p. 12.

⁵⁰Walter Reuther, "Labor's Stake," The Challenge of Automation, (Public Affairs Press, 1955), p. 45.

Still another authority has stated his belief that the problem is merely one of arriving at a satisfactory combination of higher output and shorter input while avoiding unemployment. In a Report of a roundtable discussion on "The Effects of Computers on Personnel", one of the participants gave still another point-of-view:

We have a national problem to be concerned with. The Federal Government has a responsibility. They have carried it out in part, to date, in dramatizing some of the issues that confront the entire population... The next step is to define the problem to the fullest possible extent. This has not yet been done.⁵¹

There is a great deal of concern expressed by many that the greatest thing to be feared from automation is the speed with which the task is done. Irreparable harm can be done if we reach too far into the age of automation before we are socially, economically and psychologically ready for it. However, this point is open to some refutation because of the inherent inertia built into the social and economic system on which automated forces must work. After all, as has been repeatedly mentioned by many, man has survived down through the ages under the impact of crisis after crisis and in the long run seems to take each jolt in stride.

The conclusions which seem most evident are that automation is here, here to stay, and is growing at a rapid rate. It is also obvious that it will have further great impact on our way of living in both the materialistic sense and in the more spiritual sense of our cultural values. Working conditions in all their many forms will change radically in both scope and form but should not lead to any protracted imbalance that would cause an economic crisis. Finally,

⁵¹Edith Harwith Goodman, Data Processing, "Effects of Computers on Personnel." (A Report on a Roundtable Discussion), Nov-Dec 1961, p. 24.

there can be no doubt that if automation is to flourish as a source of benefit to society it must be developed and controlled wisely.

In the final analysis, a review of past performance would seem to indicate that like most social forces which have come into the world, automation will enjoy a slow and steady growth for the ultimate benefit of all. In the words of Edgar Weinberg, "the brakes on any improvident speed with which automation might enter into our society will be supplied by the elusive and sensitive factor."

It would be most fitting to close this paper on a note of warning that we should use common sense and caution as we venture forward into an unknown future:

We may live to see once more confirmed a great Truth of human history that suicide, not murder, is the normal form of death of a cultural system...It is not the strength of the barbarians but the moral and intellectual weakness of the civilized that is usually their undoing.⁵²

⁵²Dr. Wilhelm Roepke, President of the Mont-Pelerin Society, an Association of Libertarian Scholars. Quoted in the Wall Street Journal, April 16, 1962

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